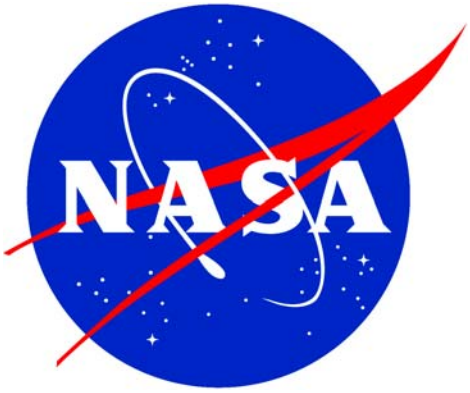

National Aeronautics and Space Administration

Office of Education
Technology and Products/eEducation

Intramural Call for Proposal Ideas (ICPI)
Fiscal Year 2007

Internal Call for Proposal Ideas
NASA Learning Technologies

ICPI Schedule

Release of ICPI: March 20, 2007
Notices of Intent Due: April 20, 2007
Notices of Intent Decisions: April 30, 2007
Final Proposals Due: June 29, 2007
Selection: July 31, 2007
Announcement of Awards: September 1, 2007

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Part One: Overview Information

To successfully advance the Vision for Space Exploration (VSE), NASA is continually refocusing and streamlining its organization, realigning ongoing programs, and tapping the innovative talents of our nation. To accomplish the VSE goals of returning to the moon and going beyond to Mars, NASA must find ways to enhanced science, technology, engineering and mathematics (STEM) education. This intramural call for proposal ideas seeks to develop a persistent, online, synthetic environment that will support NASA's STEM education goals and allow millions more American to share in the experience of NASA science and exploration virtually.

Office of Education Strategy

NASA faces the prospect of having an insufficiency of trained professionals in science, technology, engineering and mathematics (STEM) fields to fulfill the Vision for Space Exploration. The shortage of a highly skilled technical workforce is not a NASA-unique problem, but one faced by the Nation as a whole. It is shortsighted to think that NASA should expect to attract a greater proportion of a shrinking pool of new STEM graduates in the near future. The best course for NASA and the Nation is to expand the overall number of STEM graduates. Increasing the STEM graduate pool requires either guiding more students onto paths that lead to STEM degrees, increasing the percentage of students on those pathways that complete STEM degrees, or both. Those three possible approaches suggest three target populations for STEM enhancement:

- Students who have the capability to pursue academic careers in STEM but do not do so.
- Students who have the capability to pursue academic careers in STEM and do so, but withdraw from STEM programs.
- The teachers and influence agents who impact either STEM education directly or who influence academic career decisions.

NASA lacks the resources and the mandate to directly alter the fabric of the American education system, thus adopts the charge in the *2006 NASA Education Strategic Coordination Framework* to increase the pool of students who graduate in STEM degree fields. To meet that charge, NASA Education must strategically use resources with the greatest potential to impact the target populations.

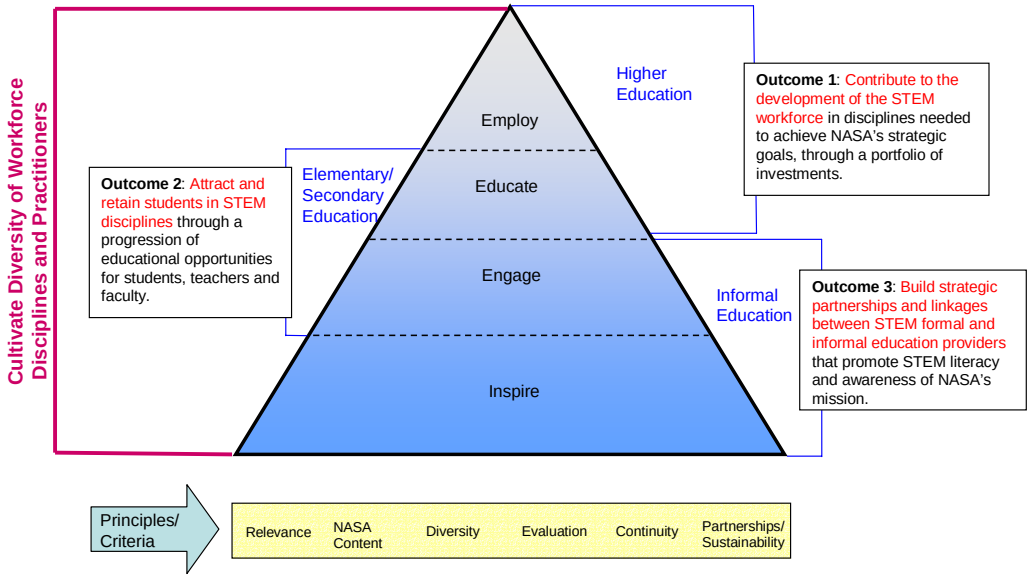
NASA eEducation: Outcomes and Categories of Involvement

NASA contributes to our Nation’s efforts to achieve excellence in science, technology, engineering, and mathematics (STEM) education. Three outcomes serve to align all Agency education investments. NASA eEducation has been identified as a cross-cutting function that supports all three of the Agency’s education outcomes and is expected to target specific audiences with appropriate levels of involvement to cut across all four levels of the Education Framework.

NASA eEducation investments are expected to map to at least one of the three NASA Education outcomes as part of annual performance and to contribute to the appropriate annual performance goals (APGs).

> Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals, through a portfolio of investments.
>
> Outcome 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty.
>
> Outcome 3: Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission.

The NASA eEducation Program sustains the research and development of technology applications, products, and services and to implement technology-enriched infrastructures in facilitating the appropriate and effective technology-based applications to enhance the educational process for formal and informal education. In addition, eEducation identifies projects that meet the President's Management Agenda of providing citizen-centric services related to NASA Education efforts.



The intent of eEducation is to develop an infrastructure and deploy research-based technology applications, products, and services that enhance the educational process for formal and informal education. It serves a cross-cutting function across the three education divisions and effectively addresses all four levels of involvement as depicted in

the Education Strategic Framework. Serving to provide guidance and continuity across the eEducation Program is a research roadmap. This roadmap is intended to embrace other interested NASA and external entities to coordinate research and leverage federal technology investments. (http://learners.gsfc.nasa.gov/NLT/Roadmap/)

NASA Learning Technologies (LT) supports the development of projects that deliver NASA content through revolutionary technologies to enhance education in the areas of science, technology, engineering and mathematics (STEM). Research and development are at the core of the LT mission. Learning Technologies is part of NASA's eEducation program and is NASA's educational technology incubator. LT seeks to enhance formal and informal education in STEM fields with the goal of increasing the number of students in those fields of study. NASA Learning Technologies couples the talents of educators, industry, academia, non-profit organizations and NASA's Mission Directorates to develop educational technologies that enable, empower, and educate learners of diverse backgrounds, characteristics, and abilities.

The Learning Technologies project office is located at Goddard Space Flight Center in Greenbelt, Maryland. LT is a NASA-wide initiative with representatives and projects at several NASA Centers.

Part Two: Funding Opportunity Description

Rationale:
Massively multiplayer online games (MMOG) have characteristics that set them apart from other games. They are shared spaces where hundreds, thousands and even millions of players can experience the same game. They are persistent and evolving online environments. For example, with a stand-alone game, the game environment turns on and off at the user's whim and is essentially loaded with all of its potential states when it is shipped from the factory. If there is a sequel, the new game comes with a brand new, though probably familiar, game environment. MMOGs, in contrast, run continuously. Actions by players can alter the game world and the game creators can change features of the world through expansions or patches. The persistent and evolving nature of MMOGs makes them more like the real world and less like the static, intermittent nature of stand-alone games. The game setting in MMOGs, is thus a synthetic world, while the game setting of a stand-alone game is not.

A massively multiplayer online NASA game can be built with the primary goal of engaging young people in NASA's mission. The power of games as educational tools is rapidly gaining recognition (Gee, 2003). NASA is in a position to develop an online game that functions as a persistent, synthetic environment supporting education as a laboratory, a massive visualization tools and collaborative workspace while simultaneously drawing users into a challenging, game-play immersion. Innovative university faculty are already holding classes and taking fieldtrips to synthetic worlds like *Star Wars Galaxies* and *Second Life* (Thomas, 2005). A NASA game built on a game engine that includes full physics capabilities will support accurate in-game

experimentation and research. It will present real NASA engineering and science missions in a medium that is comfortable and familiar to the overwhelming majority of students in the United States today. A NASA-inspired game will provide opportunities for students to investigate Science, Technology, Engineering and Technology (STEM) career paths. A NASA game can contribute to the development of the critical skills and capabilities needed to build a pipeline of qualified scientific and technical employees required to fulfill the Vision for Space Exploration. Recently, both Time and Fortune have recognized synthetic environments and robust and significant technology entering mainstream society. The MacArthur Foundation, the Federation of American Scientists and National Science Foundation have all identified computer games as significant educational tools. A Horizons of Technology report marked massively multiplayer online games as one of the technologies with the greatest potential to impact education in the next decade.

A game-quality synthetic environment will be a vital element of NASA's cyberstructure. The synthetic world will be a collaborative work and meeting space of a kind familiar to increasing numbers of Americans. Games and challenges in the synthetic environment will engage students in a way that is both familiar and comfortable for them. In turn, success in the games will build increased student awareness of STEM fields. The synthetic environment will allow immersive career exploration opportunities in a much deeper way than reading alone would permit and at a fraction of the time and cost of an internship.

Strategy:
LT seeks proposals to develop a massively multiplayer online game (MMOG). It is intended that such an MMOG be the front-end of a larger synthetic environment. Proposers are expected to address how they will develop an MMOG and a developers' toolkit to support expansion. An appropriate application of the technology should be able to support both formal and informal education efforts, but the initial implementation should focus on formal education. Proposers are expected to select and identify connections to NASA missions and NASA Education Outcomes and criteria (See *Part Six*.) Learning Technologies is particularly interested promoting the development of an MMOG with a powerful physics engine to support accurate science and engineering concepts and challenges. NASA career exploration, challenges and significant STEM learning experiences as well as engaging game play are important elements that should be addressed in a proposal.

Awarded projects will be expected to work closely with the Learning Technologies Project Office to maximize the potential for a successful outcome in this innovative endeavor.

Funding Level:
Learning Technologies anticipates funding not to exceed $1 million per year for three years. In the first year, LT expect to make two or three awards depending on the quality of received proposals. At the end of the first year, one project will be selected to receive the entire funding amount for the remaining two years of the award. Additional funds

from Mission Directorates, Field Centers, Headquarters, and/or external sources may be used to supplement LT-funded projects. If additional funds are leveraged to support project proposal, the proposal must include a statement of commitment and availability of funds signed by an authorizing official. This should be included on the cover page. The Learning Technologies project office will seek additional funding from the Mission Directorates and other internal and external sources to augment funding in the second and third years of project performance.

Part Three: Eligibility Requirements

This call is open to all NASA centers and the Jet Propulsion Laboratory. A center Civil Service or JPL staff member (not contractors) must be the principal investigator and proposal submitter. Collaboration and cost-sharing are encouraged. Each proposing team **must** include a partner with commercial-quality game development experience. It is expected that this requirement will necessitate partnering with external organizations and that the majority of funding will be used for game development. Proposers are strongly encouraged to work with their Center Education Office (See *List of Contacts* in *Appendices*).

Number of Proposals and Teaming Arrangements:

There is no restriction on the number of proposals that an organization may submit to this solicitation or on the teaming arrangements for any one proposal, including teaming with employees of NASA's field Centers and the Jet Propulsion Laboratory. However, each proposal must be a separate, stand-alone, complete document for evaluation purposes.

Sub-Award Cost Sharing or Matching:

If an institution of higher education or other not-for-profit organization is part of the proposal, sharing is not required, although NASA can accept cost sharing if it is voluntarily offered (see the *Grants Handbook*, Section B, Provision 1260.123, "Cost Sharing or Matching"). If a commercial organization is part of the proposal, cost sharing is required unless the commercial organization can demonstrate that it does not expect to receive substantial compensating benefits for performance of the work. If this demonstration is made, cost sharing is not required but may be offered voluntarily (see also Section D, Provision 1274.204, of the *Grants Handbook*).

Part Four: How to Submit

Notices of Intent (NOI)

- NOIs are **required** for the Learning Technologies ICPI FY2007.
- Proposers must use the NOI form appended to this document (See *Proposal Forms* in *Appendix*). Please note that NOI narratives are limited to 500 words; NOIs exceeding 500 words will not be considered.
- Electronic copies letters of intent to support the proposal from each proposed collaborating institution must accompany the NOI.

- Before submitting the NOI, save the file in a Microsoft Word document (.doc), Adobe PDF (.pdf) or in Rich Text Format (.rtf) on your computer.
- E-mail the file to Nesnews@nasa.gov **no later than** 11:59 p.m. on April 20, 2007. Proposers are authorized to submit NOIs directly.
- NOI decisions will be released on April 30, 2007.

Proposals

- Proposers with approved and accepted NOIs will be invited to submit full proposals to this ICPI.
- Proposals are limited to ten (10) pages of descriptive narrative. Any additional pages will not be read or considered by the review panel. The ten-page limit *does not include* Form A (Proposal Cover Page), Form B (Budget and Staffing Requirements) or letters of collaboration/partnership.
- Before submitting the proposal, save the file in a Microsoft Word document (.doc), Adobe PDF (.pdf) or in Rich Text Format (.rtf) on your computer.
- E-mail the file to Nesnews@nasa.gov **no later than** 11:59 p.m. on June 30, 2007. Proposers are authorized to submit NOIs directly.

Part Five: Instructions for Preparation of Descriptive Narrative

The descriptive narrative must be prepared in a Microsoft Word document (.doc), Adobe PDF (.pdf) or in Rich Text Format (.rtf). Type size should be no smaller than 12 point Times New Roman.

Technical Plan
The technical plan should include a descriptive narrative. The descriptive narrative should include, but it is not limited to, the following:

- ***Overall Project Plan:*** Provide a description of the essential components of the project plan should:
  1) demonstrate state-of-the-art technology
  2) demonstrate technical merit of the proposal and/or unique and innovative methods, approaches, concepts, or advanced technologies
  3) align with the focus and objective of this ICPI

- ***Deliverables*:**
  1) A persistent MMOG synthetic environment built on a game engine that has accurate physics capabilities,

2) Well-documented "hooks" in the software to allow NASA evaluators to assess student learning
3) A toolkit to allow expansion of the environment with relative ease
4) Guides for formal and informal educators to demonstrate connection to curriculum and national standards
5) Monthly, quarterly and annual reports as described in the eEducation Portfolio Management guide.

NASA Education Operating Principles

- ***Content***: Content should
  1) be based on NASA Mission Directorate content
  2) be relevant to national education standards content topics
  3) demonstrate relevance NASA's Vision and Mission

- ***Accessibility*:**
  1) Describe how the products or experiences will be delivered to the target audience
  2) conferences, workshops, museums, science centers, and community-based organizations, for delivery of the proposed project idea.

- ***Relevance:*** For the proposed project, state how the goals, objectives, and products
  1) align with the NASA Education goals, focus areas, and funding category objectives
  2) meet the NASA Education Operating Principles.

- ***Focus:*** For the proposed project
  1) describe an educational need identified by educational research, an educational community, a customer, a customer group, or NASA's future workforce forecast
  2) identify a specific, primary audience and estimate the number to be reached
  3) list all deliverables planned for this project and the type of learning environment most appropriate for delivery (e.g., classroom, after school program, higher education internship)
  4) explain how the deliverables address the need and will reach the customer.

- ***Continuity:*** Explain how the project will
  1) acquaint teachers and students with NASA-related science, technology, engineering and mathematics (STEM) career options
  2) contribute to NASA's pipeline portfolio by creating linkages to other NASA educational opportunities both inside and outside NASA.

- ***Diversity*:** Describe how the proposed project

1) reaches an identified targeted audience and contributes to the involvement, broad understanding, and/or training of underrepresented, underserved, and/or underutilized groups
2) develops activities and experiences with consulting expertise of the targeted audiences.

Management Plan
The management plan should include both a descriptive narrative and completion of Form B (Budget and Staffing Requirements). The descriptive narrative should include, but it is not limited to, the following:

- ***Overall Management Plan:*** Outline an overall management plan that
  1) describes roles and responsibilities and clear lines of authority,
  2) identifies all key personnel and their specific responsibilities
  3) provides a brief description of key personnel qualifications for the stated responsibilities,

- ***External Partnerships and Collaborations*****:** This section should
  1) provide names and contact information for all collaborators and/or partners,
  2) specify any formal agreement(s) associated with the project, provide detail of the participation by partners or collaborators (e.g., funding, distribution, content, in-kind contribution). **Note:** Contractor and/or university personnel providing support to this project are not considered to be external partners or collaborators.

- ***Time Lines:*** Include a detailed time line that
  1) provides an overall schedule,
  2) identifies deliverables with completion dates
  3) lists key milestones.

- ***Metrics and Assessment*****:** For the proposed project describe
  1) quantitative and qualitative measures of success
  2) planned formative and summative assessments
  3) how the project reporting plan will document outcomes and outputs
  4) the coordination of all collaborator and partner input into the reporting plan.

Cost Effectiveness Plan
The cost effectiveness plan should include both a descriptive narrative and completion of Form B (Budget and Staffing Requirements). The descriptive narrative should include, but it is not limited to, the following:

- ***Budget Justification:*** Justify that
  1) the stated budget is reasonable and

2) the scale and outcomes of the proposed activity are commensurate with project funding. In addition, provide detail for and justify major expenditures.

- ***Value Added:*** Describe how
  1) the project employs cost saving measures and efficiencies (e.g., in-kind contributions and funds leveraged from partners' resources)
  2) this proposed effort provides value or return on investment for NASA Education.

Instructions for Preparation and Submission of Form B (Budget and Staffing Requirements)

Form B must be submitted for each proposal. If the proposal involves collaboration between NASA Field Centers, a Form B with complete information on the project's roles and responsibilities for each participating Center, plus a summary Form B, must be submitted by the project's lead Center.

Proposal Submission Dates and Times

Proposals shall be submitted electronically. Proposals must be submitted electronically by 11:59 p.m. on June 27, 2007, to Nesnews@nasa.gov.

Part Six: Review and Selection Process

Proposals will be reviewed and selected in a four-phase process:

- Phase One: Notice of Intent (NOI) Review
- Phase Two: Merit Review
- Phase Three: Integration Review.
- Phase Four: End of Year 1 Review

Phase One: Notice of Intent (NOI) Review

The first phase will include an evaluation of the NOI submitted for each proposed project. In this phase, Learning Technologies staff will review NOIs for compliance to instructions and relevance to the LT area of focus and objectives as described in Part One and Part Two of this ICPI. Only those NOIs that successfully pass this review will be invited to submit a complete proposal. LT staff may suggest areas of the proposal to emphasize or de-emphasize, or that proposers consider teaming with other proposers, prior to submission of a full proposal. *(See Part Five for instructions on preparing and submitting NOIs.)* NOI decisions will be released on April 27, 2007.

Phase Two: Merit Review

An external peer review panel will conduct a merit review of all full proposals. The panel—comprised of science, technical and education experts—will assign

each proposal a consensus score from 0 to 100, based upon the project's technical and management plans.

- **Technical Plan**
  The technical plan demonstrates the degree to which the project's design and planning meets requirements of the Learning Technologies ICPI and those of the NASA Education Operating Principles. The technical plan includes a descriptive narrative *(See Part Six, Technical Plan).*
- **Management Plan**
  The management plan demonstrates a high probability for successful implementation by describing definite lines of authority and responsibility and providing quantifiable performance targets and time lines with an explanation of how performance will be managed to achieve success. The management plan includes a descriptive narrative *(See Part Six, Management Plan).*

Phase Three: Integration Review

An integration panel will meet after completion of the merit review to prepare selection recommendations. In this phase, Learning Technologies staff will consider the findings of the merit review along with the overall project relevance. Funding recommendations will be based on selecting the best candidates to receive an initial year of funding.

The selection recommendations prepared by the integration panel will be submitted to the Learning Technologies Project Manager, who will serve as the selecting official.

Phase Four: End of Year One

At the end of the first year of funding, the awarded projects will be reviewed by a panel composed of representatives from LT, eEducation, the relevant Mission Directorates and Office of Education Divisions. One project will be selected to be funded with the full amount of the award for the following two years.

Announcement of Awards

The Learning Technologies project manager will notify all ICPI participants of decisions with respect to their proposals via electronic mail by September 1, 2007. A complete list of the final selection decisions will be distributed to all proposers. A notification letter, the final consensus score of the panel and the panel evaluation will be provided to the proposer. ICPI participants who would like additional information about their proposals may contact Learning Technologies project office by email at Nesnews@nasa.gov.

PART SEVEN: OTHER INFORMATION

Proposers are advised to refer to the following documents:

- The Vision for Space Exploration
  http://www.nasa.gov/pdf/55583main_vision_space_exploration2.pdf
- NASA's Strategic Plan
  http://www.nasa.gov/pdf/1968main_strategi.pdf
- NASA's Office of Education Operating Principles
  http://education.nasa.gov/about/strategy/index.html
- The Guidebook for Proposers Responding to a NASA Research Announcement (NRA) Edition: January 2007
  http://www.hq.nasa.gov/office/procurement/nraguidebook/

NASA CONTACTS

Center Education Officers	***Phone***	***E-Mail***
Ames Research Center		
Brenda Collins	(650) 604-3540	Brenda.J.Collins@nasa.gov
Dryden Flight Research Center		
Miriam Rodón-Naveira	(661) 276-3647	Miriam.M.Rodon@nasa.gov
Glenn Research Center		
Jo Ann Charleston	(216) 433-2957	Jo.A.Charleston@nasa.gov
Goddard Space Flight Center		
Robert Gabrys	(301) 286-7205	Robert.E.Gabrys@nasa.gov
Jet Propulsion Laboratory		
Parvin Kassaie	(818) 354-8814	Parvin.Kassaie@jpl.nasa.gov
Johnson Space Center		
Susan White	(281) 483-7011	Susan.M.White@nasa.gov
Kennedy Space Center		
Gregg Buckingham	(321) 867-8777	Gregg.A.Buckingham@nasa.gov
Langley Research Center		
Roger Hathaway	(757) 864-3312	Roger.A.Hathaway@nasa.gov
Marshall Space Flight Center		
Tammy Rowan	(256) 256 961-0954	Tammy.B.Rowan@nasa.gov
Stennis Space Center		
Herring, Dewey	(228) 688-1329	Dewey.L.Herring@nasa.gov

APPENDIX

NOTICE OF INTENT TO PROPOSE

1. TITLE OF PROJECT

2. APPLICANT NASA CENTER

3. PROJECT LEAD (First and last name)

4. PROJECT LEAD TELEPHONE NUMBER PPROJECT LEAD FAX NUMBER PROJECT LEAD E-MAIL ADDRESS

5. Expected Participating NASA Centers and Other Collaborating Institutions (if applicable) [Information is non-binding]

6. PRELIMINARY BUDGET ESTIMATE (full cost)	7. PRELIMINARY FTE ESTIMATE (rounded to nearest FTE) Average number of FTEs over the entire project duration:

8a. Identify the Mission Directorate your project will be based on.	8b. Identify the game engine that will used for your project.	8c. List any other collaborating institutions of entities not named above (information is non-binding).

9. BRIEF SUMMARY

Prepare a brief description of the application stating the broad, long-term objectives and specific aims of the proposed work including specific milestones and deliverables. Describe concisely the project design and methods for achieving these objectives and aims. Provide an estimate of total project costs and term of the proposal (less than one year, up to three years maximum). This summary will serve as the proposal abstract**. Limit summary to 500 words or fewer.**

FORM A: PROPOSAL COVER PAGE

IN RESPONSE TO NASA LEARNING TECHNOLOGIES INTRAMURAL CALL FOR PROJECT IDEAS, 2007 PLEASE FOLLOW INSTRUCTIONS CAREFULLY	NUMBER

1.COMPLETE TITLE OF PROJECT

2.APPLICANT NASA CENTER

3.PROJECT LEAD (First, middle, and last name; degrees; position)

4. PROJECT LEAD
COMPLETE MAILING ADDRESS
Internal Mail Code or Location
Office or Organization
Division
NASA Center
Street or P.O. Box

City, State, Zip Code

5. TELEPHONE NUMBER (area code, number, extension)	FAX NUMBER	E-MAIL ADDRESS

6. CO-INVESTIGATORS (First, middle, and last name; degrees)	7. CO-INVESTIGATOR'S ORGANIZATION AND CONTACT INFORMATION

8. OTHER PARTICIPATING ORGANIZATIONS (i.e., other NASA Centers, universities, federal Government Laboratories, the private sector, state and local government laboratories):

9. DATES OF ENTIRE PROPOSED PROJECT PERIOD From: Through:	10. TOTAL BUDGET Total Cost:	11. FTEs Average FTEs/Year:

13. PROJECT LEAD ASSURANCE:

I agree to accept responsibility for the technical conduct of the project and to provide the required progress reports if a project is awarded as a result of this application.

SIGNATURE OF PERSON NAMED IN 3
(In ink; "Per" signature not acceptable.)

DATE

15. PROPOSED PROJECT ABSTRACT

Prepare a summary of the proposed project, stating the project goals and the methods for achieving the goals. Explain how the project contributes to NASA Education's guiding principles and education goals. This summary serves as an indication of the proposed work. **Limit summary to 500 words or fewer.**

FORM B: BUDGET AND STAFFING REQUIREMENTS

Field Center or Summary	
Project Lead	
Project Title	
Field Center Budget POC	

	Year 1		Year 2		Year 3		Total	
Element of Expense	($K)	FTE/WYE	($K)	FTE/WYE	($K)	FTE/WYE	($K)	FTE/WYE
CS Salaries								
Center Institutional Cost								
CS Travel								
Other Government Costs								
Contract Costs(1)								
In-kind contributions (2)								
Total Costs								

(1) Show all Non-NASA Costs including salaries, indirect, overhead, travel, other procurements and other costs in this row
(2) Show any in-kind contributions (cash or value), if any, from partners on this line.